A STUDY OF STOCK PRICE REACTIONS TO THE DECISIONS OF THE FEDERAL OPEN MARKET COMMITTEE (FOMC) ON CHANGES IN THE FEDERAL FUNDS RATE

Wesley Bushnell, B.S.

Problem in Lieu of Thesis Prepared for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

May 2002

APPROVED:

Terry Clower, Major Professor
Bernard L. Weinstein, Director
David W. Hartman, Dean of the School of Community Service
C. Neal Tate, Dean of the Robert B. Toulouse School of Graduate Studies

Bushnell, Wesley, A Study of Stock Price Reactions to the Decisions of the Federal Open Market Committee (FOMC) on Changes in the Federal Funds Rate. Master of Science (Applied Economics), May 2002, 71 pp., 15 figures, references, 21 titles.

This paper analyzes stock index reactions to interest rate actions by the FOMC. Unlike previous analyses this study utilizes macro-economic indicators and accounts for pre-decision market expectations. Results indicate significant reaction of the stock market to the actions of the FOMC regardless of interest rate actions matching pre-decision market expectations. Binary dummy variables representing the five days following an FOMC meeting indicate a significant reaction for days one; two and three of the Dow Jones model and for day five of the NASDAQ model. The magnitude of the coefficients are 0.17%, 0.09%, -0.07% and -.15% respectively. These findings may be sensitive to a priori choices regarding the definition of the market expectation variable.

TABLE OF CONTENTS

LIST OF FIGURES

Page

INTRODUCTION

A certain debate in financial economics centers on the idea of predictability in financial markets. It is a battle between those who subscribe to the idea of efficiency and those who proclaim the markets to be inefficient. Numerous anomalies in the system have been championed as proof of inefficiency and subsequently proven to be matters of chance. It is not the purpose of this paper to prove one theory over the other; it suggests a more macro economic approach to the question than has been taken thus far. Do the actions of the FOMC have any predictable effect on the market or will investor expectations have anticipated FOMC actions to such an extent that only an unexpected move produces an anomaly?

The efficient market hypothesis, first documented in the 1960's by Eugene Fama, describes market forces: “In an 'efficient' market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future.” (Fama 75) It is of macroeconomic forces that Mr. Fama speaks. His theory talks about large numbers of 'rational, profit maximizers' competing in markets flooded with various kinds of securities and bits of information too numerous to count. As a result of this activity, no single investor will be able to predict short run price volatility in order to achieve a return superior to that of a buy and hold investment strategy. In these markets only luck brings a superior return and all players, professional and novice, are on equal footing.

The opposition contends this is not the case. As evidenced by Mr. Fama's own wording, one of the assumptions of an efficient market is competition between intelligent investors who react rationally to new events. In violation of this assumption, everyday experience suggests most investors do not make decisions based on pertinent facts or utilize sound judgment in their interpretation of market events. According to DeBondt and Thaler most people "tend to overreact to unexpected and dramatic news events" (804) producing identifiable anomalies that prove that market efficiency is irrelevant. For example, it has been suggested that the negative post-listing return behavior of stocks newly listed on the New York Stock Exchange (NYSE) is attributable to investor overreaction. When a stock is released to the public, investors will overreact, biding the price of the stock up before the profit taking mechanism takes over and the price begins to fall. Another explanation or a coincident explanation suggested is the opportunistic listing of a stock prior to a period of poor performance. Another example of overreaction happens when a stock splits. When a stock splits it experiences long term positive abnormal returns both before and after the split. Another study combines the findings that company earnings do not vary enough to justify a stock's price movements with the assertion that stock movements are strongly correlated with the following years' earnings to suggest a pattern of overreaction. (DeBondt and Thaler 794). Numerous additional studies proclaim the existence of an over/under reaction induced anomaly that defies the logic of Fama's conclusions.

In response to this line of reasoning, and separate from the theoretical assertion that no single inefficient market theory can account for all market anomalies, proponents

of market efficiency have produced thousands of research papers and empirical studies of individual security analyst's earnings predictions and the performance records of mutual fund managers looking for evidence that any one individual can consistently beat a buy and hold strategy. Given the existence of the anomalies, there is no evidence that any individual has accomplished this feat.

These studies and many more like them, focus on finding anomalous returns in a small sub-set of stocks, or in the track records of a limited number of professionals. They do not address the predictability of a system wide event. Therefore, this paper will conduct an event study using macro indicators and events in an attempt to find predictability at the market level. The model will utilize the Dow Jones Industrial Average and the National Association of Securities Dealers Automated Quotation (NASDAQ) index as the portfolio and the Standards & Poor 1200 (S&P) index as a worldwide indicator of market return. Market expectations of the Federal Open Market Committee (FOMC) federal funds rate decisions will also be included in the model. It is expected that changes in the federal funds rate will produce a significant effect in the DJIA and NASDAQ indexes. Following Fama's contention that even under proof of a market anomaly, the overreactions and under reactions will balance each other out upholding the theory of market efficiency, data from the futures market will be utilized to calculate market expectations and give a probability estimate of the actions of the FOMC. It is hypothesized that the inclusion of market expectations in the model will prove any effect on the indexes to be attributable to instances of unpredicted decisions by the FOMC.

The importance of this issue cannot be overstated. Predictability in financial markets is the marketing tool of thousands of professionals across the globe. Long Term Capital Management made billions of dollars in profit for it's clients by taking advantage of inconsistencies in various markets around the world. But, as it found out, once an inconsistency is discovered other players in the market will step in, take advantage of the inconsistency until it no longer exists. Therein lies the paradox of the financial anomaly. “If every investor believed a market was efficient, then the market would not be efficient because no one would analyze securities." (“EMH.” 2) In effect, markets depend on market participants who believe the market is inefficient and trade securities in an attempt to outperform the market.

Aside from theoretical arguments and postulations, consider the numbers involved. In 1999, the New York Stock Exchange traded 262.5 billion shares amounting to more than 11 trillion dollars. On average, 1,041.6 million shares exchanged hands every day for a dollar value of 43.9 billion dollars. (“NYSE”) In the first 90 years of it’s existence, the Dow Jones Industrial Average gained a total of 1200 points. Today it is not unusual for the market to fluctuate by more than 300 points in a single day or one quarter of the gain made in roughly eighty-five years. If we proved that professional investment analysis was worthless, then thousands of analysts and investment prognosticators might see a decline in demand for their services. (Standard Industrial Classification code 62 contains some of the biggest names in financial services; names like: The Charles Schwab Corporation, Daiwa Securities Group Inc, Merrill Lynch & Co and The Goldman Sachs Group.) It is a given improbability that any academic findings would be strong

enough to discredit an entire industry causing it to disappear. However, even small impacts can cause a ripple effect magnifying the damage. According to the U.S. Census Bureau, (2000), Security and Commodity Brokers (SIC 62) created 117 billion dollars of GDP in 1997, this industry employed 675,000 people across 45,000 establishments and paid out 68.3 billion dollars in payroll. (507)

The greatest potential beneficiary of this type of study would be the consumer of investment services. Investment strategies suggesting decisions based on some magical correlation have been prevalent since the dawn of securities market. A famous example being a system based on sun spot activity or one based on the length of the ladies' skirts currently in fashion. Information regarding the profitability of these systems or any investment strategy that proclaims short-term, commission intensive investing as being superior to a buy and hold strategy would be invaluable to many novice investors.

LITERATURE REVIEW

Market Efficiency

As noted earlier, the central issue is efficiency. Eugene Fama defined an efficient market as "a market where there are large numbers of rational, profit maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants." ("EMH." 1) Another way of stating this definition is to assert that an efficient market is informationally efficient. The mathematical model of the efficient market hypothesis is the random walk. The key feature of this series is that the value of 'y' today is highly correlated with 'y' in the future. The value of 'y' at time 't' is obtained by starting at the previous value; y_{t-1} and adding a zero mean random variable, or a stochastic variable, that is independent of y_{t-1}. In other words the value of a random walk does not depend on time, but the variance does. The variance of a random walk series increases as a linear function of time. It is a non-stationary, highly persistent series in the sense that the value of 'y' today is significant for determining the value of 'y' in the very near future but as you go further out in time, the variance of the series will increase without bound.

$$\text{if } q = p_{t+1} - p_t$$
$$\text{then}$$
$$E\{q\} = 0$$

The random walk model of stock prices states that the net change in a stock price is, on average, equal to zero. Combining this with the informationally efficient requirement of the efficient market hypothesis:

$$E\{q:I_t\} = 0$$

Where the variable 'I' represents the information available at time 't'. The expected value of a change in stock price given all the information available at that time is zero. Therefore, the expected value of a value of a stock one period into the future, given today's knowledge is the price today.

$$E\{p_{t+1}:I_t\} = p_t$$
or
$$E\{p_{t+s}:I_t\} = p_t$$
Or
$$p_{t+1} = p_t + u_t$$

The 'u' variable is a white noise term, meaning the variable (‘u’) has a mean of zero, a constant variance and is serially uncorrelated. Since the expected value of the price today is equal to the price of yesterday plus the value of the disturbance term, which is expected to be zero, the best guess of tomorrow's price is today's. One would guess from this explanation that the series would always revert to its mean value but it doesn't because all stochastic shocks to the system have a non-decaying effect. The problem with this model is the theoretical possibility that the stochastic shock could take on a large negative value causing the price of the stock to take on a nonsensical negative value. To alleviate this problem the rate of return from holding the stock one period is treated as the random variable.

$$p_{t+1} = (1+r_t)\, p_t$$

The expected price is then stated as:

$$E\{p_{t+s}\} = (1+r)^s p_t \qquad \text{(Watkins 1-4)}$$

Efficient market theory and random walk theory implies that no knowledge of published information, either public or insider, can be used to purchase and sell stocks in such a way as to make a long run profit superior to that of a buy and hold strategy. When describing a financial process as a random walk, something extraordinary occurs. By invoking this phrase you place the well informed veteran investor on the same level with the casually informed investor, you nullify all of the knowledge, education and years of experience of numerous stock analysts and traders. If markets are ruled by a random walk, the rates of return on investments of the professional and the dabbler equate over the long run. For example, if you gave a professional and an amateur a sum of money and allowed the professionals to trade as he sees fit and instructed the amateur to select at random a portfolio of stocks, holding those stocks over a period of time, the amateur's rate of return, on average, would equal that of the professional. Numerous studies have been conducted pitting professional's portfolio returns against the market and the results validate the efficient market theory. Burton Malkiel and John Craig performed a study of nineteen Wall Street firms' past earning predictions of major companies over a one year and five year time period. When compared with the actual results, the earnings estimates were off by more than thirty percent. The earning estimates made by the New York heavy weights turned out to be no better than extrapolation of estimates from past trends. Even the use of a naïve-forecasting model, assuming that all companies' earnings would enjoy a growth rate identical to that of the long run rate of growth in national income, faired better than the analyst's estimates. (Malkiel 169) The findings of Malkiel and Craig were later confirmed in a wider study done by Michael Sandretto and Sudhur Milkrishnamnrthi

who utilized a data set of "one thousand of the most widely followed companies, with estimates available from five or six analysts for each company found that the average annual error of the analyst was 31.3 percent over a five year period." (Malkiel 170)

The empirical results of studies carried out on the predictions of market professionals do not prove the market to be efficient, they only show that professionals are unable to interpret the morass of data in such a way as to earn sustained superior returns. Even Fama, in his "Market Efficiency, Long-Term Returns, and Behavioral Finance" concedes that market participants will over-react to some types of news but at the same time he states that market participants will tend to under-react to certain other kinds of news. The anomalies affecting efficiency in the market are chance results. Apparent over-reaction to information is about as common as under-reaction, and post-event continuation of pre-event abnormal returns is about as frequent as post-event reversals (Fama 25). Apparent anomalies can also be due to the methodology used in the study, most long term return anomalies tend to disappear with reasonable changes in technique. Fama's model is preferable to any alternative hypothesis put forth to date because it can account for all movement in the market. The market is composed of individuals assuming the market to be inefficient, forcing supply and demand to move in and eradicate discrepancies in price; yet if investors did not engage in this activity then the market would be inefficient. An anomaly might show the exception to the rule but eventually market efficiency will step in and show that long run inefficiency is not sustainable.

Market Inefficiency

One of the central assumptions of market efficiency has to do with investor behavior. The efficient market hypothesis assumes that investors will behave in a rational manner, yet everyday experience shows us that individuals, whether or not they are faced with an investment decision, do not behave in a rational fashion. Behavioral modifiers such as stress, fascination with magical correlations, hubris, trends and many other modifiers influence the decision making process just as they do every other decision made by humans. Several behavioral models have been put forth to try and explain the investor decision process. For example, Danile, Hirshleifer and Subramanyam argued that investors suffer from two biases: overconfidence and biased self-attribution. Overconfidence will lead an investor to exaggerate the precision of their private signals about a stock's value and biased self-attribution causes them to down weight public signals about value, especially when the public signals contradict their private signals. DeBondt and Thaler concluded that investment decisions follow a simpler pattern credited to Kahneman and Tversky that most people overreact to unexpected and dramatic news events (DeBondt and Thaler 795).

The proof of the overreaction hypothesis is predictability. In an attempt to test whether the overreaction hypothesis is predictive, De Bondt and Thaler tested the anomaly that portfolios of loser stocks (stocks with a history of poor earnings performance) will tend to out-perform portfolios of winner stocks in the future. Armed with Lakonishok, Sheifer and Vishny's argument that investors are surprised and tend to overreact when earnings growth mean reverts so that poor past performers become

winners and superior past performers become losers. DeBondt and Thaler tested the extent of association between nonzero return behavior before and after portfolio formation. Their data set focused on "stocks that have experienced either extreme capital gains or extreme losses over periods up to five years." The study concluded that after portfolio formation, the losing stocks earned about 25% more than the winners, even though the later are significantly more risky (DeBondt and Thaler 804). Unfortunately, DeBondt and Thaler never classify the meaning of 'extreme' in reference to capital gains or losses. The study indicates that the overreaction is sustained; but, if the gains or losses were extreme enough, then by definition they would also be rare occurrences and largely unpredictable.

Another way of looking at market inefficiency is to say that the lag in price response to an event is significant. Kleidon found that "stock price movements are strongly correlated with the following year's earnings changes" (18). Even Keynes spoke of this phenomenon when he observed that: "day to day fluctuations in the profits of existing investments, which are obviously of an ephemeral and non-significant character, tend to have an altogether excessive, and even an absurd, influence on the market."(Ch. 12)

The key to defeating market efficiency is the ability to predict the anomaly. If the market reacts differently, at different points in time to the same information, then the market is efficient. Even Fama concedes that the theory of market efficiency is a faulty description of price information, but when compared to the gross assumption of inefficiency, market efficiency is a better-specified model. Any alternative theory must

specify the modifiers that cause a person to overreact to new information. The alternative theory must specify why an individual reacts differently to new information based on the conditional modifiers that exist for the individual at the time of the decision. The same individual might react differently to the same stimulus at different points in time or he might react differently to two sets of information at the same time.

EVENT STUDY METHODOLOGY (INTERRUPTED TIME SERIES)

Event study methodology has been used extensively to search for evidence of abnormal returns in stock price data. For the purposes of this paper, an abnormal return will be defined as a rate of return exceeding returns of a broad market portfolio held for a specified period of time. The search for these abnormal returns using a market model is relatively straightforward. Basically you are comparing the market return on an investment or a portfolio (the dependent variable), against the return on a broader market index (the independent variable) while identifying a single or reoccurring event. Time series data is collected on the independent and dependent variables and the event periods are identified using a dummy variable. Douglas Lamdin used an event study to look for abnormal returns in response to a regulatory stimulus. The model used here, described in detail in the next section, will be based on Lamdin's model. Lamdin specified three concerns in using this type of analysis. The first is the extent to which the findings can be interpreted as a true measure of the impact of the decision by the FOMC. The second concerns the use of event studies to evaluate opposing theories. And the third concerns the low power of the event study due to the period uncertainty problems (the five days following a decision) (Lamdin 13).

This first problem defines the crux of the event study. In event studies, especially with the one being proposed here, the focus on immediate market reaction to an event essentially ties any reaction to that event, the reaction is assumed to be caused by the event when in fact it might be caused by something outside of the model. Instead of capturing the relationship between market indexes and the actions of the FOMC, we

might capture some unanticipated relationship between market indexes and some other variable. In the hours immediately following a decision, investors begin to speculate on the actions to take place at the next meeting. These expectations are reflected in the market in the form of a futures contract; the 30-day federal funds rate. As new unemployment data, inflation figures, exchange rates and a myriad of other data become available those expectations are altered. As the meeting passes, the actual impact of the decision takes it's toll on the indexes; but, is the impact caused by the decision or some other impact that occurs simultaneously with the decision? Changing the federal funds rate has been used as a tool to steer the economy for the past decade. It is assumed that no other expected stimulus, as opposed to an unexpected stimulus such as a terrorist attack or the sudden collapse of a company due to fraud, is more important. It is further assumed that the use of more than eighty event periods throughout the event window will expose any chance spurious effects.

"An event study examines the return (capital gains plus any dividend) during the "event window' to determine whether these returns were abnormally positive or negative" (Lamdin 3). One of the main problems with event studies is the identification of event periods. It is difficult to identify a single date at which a regulatory change was first suggested as well as identifying the date at which the impact of the event ceases to be a factor. Without careful consideration by the analyst, it is conceivable that some event periods would go unnoticed and that some false reactions, reactions attributable to another source, would be included in the study. Because of this uncertainty, event studies suffer from the problem of low power in detecting an events impact. Low power tests

"will cause the analyst to conclude that an event did not have any impact, though in fact it did (a Type II error). Looked at in a more positive light, if an event is found to have had an effect, this finding emerged in spite of a low power test conspiring against it" (Lamdin 17). Unlike the event studies carried out by Lamdin, the event window in this study is easily definable. It could be argued that market anticipation and subsequent discounting of a FOMC action might make precise identification of the event window difficult. The inclusion of the federal funds futures market should account for any discounting that has occurred in anticipation of the decision. "Event period uncertainty causes tests to be less powerful in rejecting the hypothesis of no effect when the hypothesis is false in comparison to events with known dates" (Lamdin 13). For the purposes of this study the event window is February 1990 to March 2001. The event period is defined as the five days following a meeting of the FOMC. Beginning with the announcement of the committee's decision and finishing with the closing bell of the NYSE five days later. For the purposes of this study it will be assumed that the pre-event activity will be captured by the inclusion of the futures' contract price in the model. "If it is possible for the analyst to do so, events that were true surprises, or at least less likely to have been anticipated should be identified." (Lamdin 17) The inclusion of the federal funds futures contract will serve, via a calculation, to identify unexpected event outcomes.

Consideration must now be given to the last problem involved in using this model. Estimation of this model using ordinary least squares assumes that the error term has an independent and an identically normal distribution. Unfortunately, stock returns do not have this ideal distribution, potentially biasing the significance test. To account for

this problem the model will be estimated first using ordinary least squares methodology and then a robust regression methodology will be used and the results compared.

The use of empirical evidence to analyze opposing theories rarely results in absolution. The confines of parsimony prohibit an exhaustive detail of any argument. This study suffers from several other problems. The methodology utilized suffers from low power due to period uncertainty. Identification of the start of the event is easily identified as the point at which an interest rate action is announced. Pre-event expectations are included in the model via the inclusion of the federal funds futures contract in the model. The end of the event period is also easily identified as the closing bell on the fifth day following the announcement. The effects of the decision on stock indexes could extend past the subjective period end date; this is the cause of ambiguity in the event periods of this study. According to Fama: "market efficiency must be tested jointly with a model for expected (normal) returns." Although this model accounts for event expectations, it peripherally accounts for expected normal returns. This study models the DJIA and the NASDAQ reaction to an event. These two indexes are proxies for the normal market return of the American economy. A measure of world market return was included in the model but considering the size of the American economy in relation to the world market this inclusions contribution is questionable.

It is not the intent of this study to decide the issue of efficiency in modern financial markets. The intent of this study is to offer some unique conclusions to add to the argument. It is a macro study in that the event is unarguably a macro stimulus and it's effect is measured against broad market indexes. If the dummy variables measuring event

impact were to prove significant, the implication of inefficiency would be harder to refute than an anomaly observed as a result of a stock tender or a merger announcement. The purpose is to search for predictability.

Federal Funds

Investors as a whole have expectations regarding the course of future events and those expectations result in individual behaviors. These decisions, repeated thousands of times a second, are what move the market system around. The problem is in quantifying these expectations. In the case of a change in the federal funds rate, expectations are quantified in terms of a derivative security; the 30-day fed funds rate.

Thus we have a stimulus, an action or inaction by the FOMC, a quantification of the expectations of the market participants concerning this stimulus, and a historical record of the effects of this stimulus on the NYSE. In simplistic terms, the FOMC has five choices. It can raise or lower the federal funds rate by a half point or a quarter point or it can leave it unchanged. Arguably it has many more choices than these simple five, it can raise or lower the rate by more than a half point, say by three quarters of a point or a whole point. The FOMC can also modify their decision by way of a statement about the future actions of the FOMC released after the meeting but in this analysis we will restrict the body's choices to these five.

Financial futures were first traded in 1975. This trading of a standardized derivative security is designed to shift market risk in the face of interest rate volatility to a third party. The expectations hypothesis "suggests that the present price of a futures

contract represents the market's consensus expectation of the future spot price" (Van Horne 150). According to this theory, the price of a futures contract conveys expectations about the spot, or actual, price to prevail in the future. There is some argument, or question, on whether or not these futures contracts are biased estimates of the future spot price. John Maynard Keynes put forth the theory of normal backwardization, and implied that in order to transfer risk from the hedgers to the speculators, a price concession must be made. Therefore Keynes's theory states that the price of a futures contract must be less than the expected future spot market price, and as a result is a biased estimate. Normal contango theory states that reward must be offered to speculators to entice them into the market and therefore futures prices will be greater than the expected spot price. (Van Horne 150) In this instance we will make the assumption that the expectations hypothesis holds and futures prices in general are an unbiased estimate of expected spot prices.

For illustrative purposes a brief explanation of a futures contract pricing to offered. There are many theoretical systems to pricing a futures contract, but according to the law of one price all of them will arrive at the same result. According to this law: "any financial asset or liability must have the same price regardless of the means by which it is created" (Van Horne 244). To illustrate the pricing of a futures contract consider the arbitrage model. In this model, the price of the futures contract is based on the price of a bond in the cash market, the coupon rate on the bond, and the interest rate for borrowing and settling until the settlement date. Suppose that we have a 20-year, 100 par value bond with a coupon rate of 12 percent, and it is selling at par value. Let us further suppose that this bond is the deliverable for a futures contract that settles in three months. If the

current three-month interest rate at which funds can be loaned or borrowed is 8 percent per year, then there is some profit to be made. Suppose that the price of a futures contract is $1070. First we sell the futures contract at $1070, then we purchase a bond for $1000 but we borrow the money to purchase the bond for three months at 8 percent per year. The borrowed funds are used to purchase the bond, resulting in no initial cash outlay for this strategy. Three months from now, the bond must be delivered to settle the futures contract and the loan must be repaid. Proceeds from the settlement of the futures contract would be $1070 plus $30 interest paid on the bond and the total outlay for repayment of the loan would be $1020 resulting in a profit of $80. Obviously, in a well-functioning market, arbitragers would buy and sell in such a way so as to eliminate this profit. They would buy the bond and sell the futures, forcing the futures price down and bidding up the bond price. In equilibrium, the theoretical futures price occurs where the profit from these trades are zero.

$$\text{Profit} = F + CTP - (P + RTP)$$

Where

R = financing rate
C = current yield, or coupon rate divided by the cash market price
P = cash market price
F = Futures price
T = Time

In equilibrium:

$$0 = F + CTP - (P + RTP)$$

Solving for the theoretical futures price, we have:

$$F = P[1 + T(R-C)]$$

The theoretical futures price may be at a premium to the cash market price or at a discount from the cash market price depending on (R-C), or the net financing cost, more commonly known as the cost of carry. The important point is that futures contracts represent a consensus opinion on what the spot price will be in the future.

This calculation allows one to assign an order of probability to the upcoming event (see the expectations probability table in the appendix). Theoretically, if the FOMC was to make its decision public and the market reacted in a predictable fashion we would reject market efficiency on a macro level. But if we were to prove that the predictability was due to a chance or unexpected occurrence, then theory of market efficiency would still hold because the reaction would be unpredictable.

ANALYSIS

Assumptions and Definitions

The expectations hypothesis was assumed to be a valid theory in describing the relationship between the price of a futures contract and the eventual spot price. In direct contradiction of normal backwardization and normal contango theory, the price of a 30-day federal funds futures contract was assumed to be an unbiased representation of the consensus expectations of the market regarding the decision of the FOMC. This assumption is necessary for the identification of 'surprise' decisions, decisions not anticipated by the market, as prescribed by Lamdin. The calculation of the market expectations indicator is a ratio of what the market expects versus the various possible outcomes. If this assumption were not valid, the identification of an unexpected outcome would be subject to an unknown bias and any conclusions based on the model would be suspect. It is further assumed that the dividing line between an expected outcome and an unexpected outcome occurs at 30 percent. So, if the FOMC were to leave rates unchanged but the market had factored in a 30 percent chance of a change, then an unexpected occurrence would be recorded. As an example, assume that the market has factored in a 70 percent chance that the FOMC would raise rates a quarter of a point and a 29 percent chance that the FOMC would raise rates a half a point. If the FOMC were to raise rates a quarter point then an expected outcome would be recorded. If however the FOMC raised the rates a half a point then an unexpected event would be recorded. It must be clearly stated that the decision to place the threshold at 30 percent is subjective and arbitrary.

Lastly, it was assumed that the S&P 1200 provided the best proxy for total market return. Arguably, the Wilshire 5000 index would have provided a more prosaic view of total market activity, but the index only measures the performance of all U. S. headquartered equity securities with readily available price data. Unlike the S&P1200 it does not contain an international component. Since the purpose of including a broad market index in the market model is to account for all other influences outside the event that is being studied, a global rather than a U.S. index would be preferred.

The Model

A standard approach to testing for abnormal returns is to use a modified version of the market model. The market model relates the return on a stock or portfolio to the return on the entire market. Lamdin used this model to examine regulatory changes, specifically the deregulation of certain industries. He modifies the model and employs a dummy variable for the event period or periods that the analyst wishes to study:

$$r_t = a + ßrm_t + G_aD_a + e_t$$

rt = return on a security or portfolio during period t
rmt = return on a representative market portfolio during period t
Da = one or more dummy variables for the event period

The model proposed by Lamdin will be the utilized to test the assertion that there is a market reaction to changes in the federal funds rate. In this paper two models will be estimated. One model will test the effect of the decisions of the FOMC on the daily return of the NASDAQ and the second will test the effect of the decision on the NYSE. The representative market portfolio will be the daily return on the S&P 1200 index. Five dummy variables representing each of the five days following a decision will be

constructed. Each will equal one for a day in which a decision is released or a specified day following the release of the decision, and zero otherwise. The data set will cover the daily return on the indexes for an eleven-year period starting February 1991 and concluding January 2002.

The following model will be estimate and the results reported:

Dow Jones Industrial Model

$$r_t = ßrm_t + G1_aD1_a + G2_aD2_a + G3_aD3_a + G4_aD4_a + G5_aD5_a + d_aE_a + e_t$$

rt = daily return on Dow Jones Industrial Average
rmt = daily return on the S&P1200 index
D1a = dummy variable for day after announcement
D2a = dummy variable for day 2 after announcement
D3a = dummy variable for day 3 after announcement
D4a = dummy variable for day 4 after announcement
D5a = dummy variable for day 5 after announcement
Ea = dummy variable indicating market expectations

Ho: ß = G1 = G2 = G3 = G4 = G5 =d = 0
Ha: not Ho

NASDAQ Model

$$r_t = ßrm_t + G1_aD1_a + G2_aD2_a + G3_aD3_a + G4_aD4_a + G5_aD5_a + d_aE_a + e_t$$

rt = daily return on NASDAQ
rmt = daily return on the S&P1200 index
D1a = dummy variable for day after announcement
D2a = dummy variable for day 2 after announcement
D3a = dummy variable for day 3 after announcement
D4a = dummy variable for day 4 after announcement
D5a = dummy variable for day 5 after announcement
Ea = dummy variable indicating market expectations

Ho: ß = G1 = G2 = G3 = G4 = G5 =d = 0
Ha: not Ho

It is the expectation of this study that any anomalies found will be explained by the market expectations, that is any superior return recorded on a decision day will be the result of the FOMC reacting in a fashion that was unexpected. For each event, or decision an expectation probability indicating the most likely outcome of the event will be assigned. If the decision of the FOMC does not coincide with the market's expectation probability indicator, then the sixth dummy variable, representing market expectations, will equal one. If the event outcome coincides with the expectation probability indicator then the dummy variable will equal zero. A table of event specific expectation probability indicators is given in the appendix.

Originally the two models, one containing the Dow Jones Industrial Average event reaction and one containing the NASDAQ event reaction, were estimated using ordinary least squares methodology. The specific data set being modeled here suffers from one significant violation of the assumptions of ordinary least squares, the assumption of heteroskedasticity. Heteroskedasticity refers to unequal variance in the residuals. This causes the model coefficients to be inefficient and it affects the test for significance. In addition to the problem of heteroskedasticity this data set contains numerous outliers. Outliers violate the assumption of normally distributed residuals in least squares regression. They tend to pull the least squares fit too much in their direction by receiving much more "weight" than they deserve. Typically, you would expect that the weight attached to each observation would be about 1/n in a dataset with n observations.

To combat the effect of these two violations, both models will be estimated utilizing ordinary least squares methodology and then re-estimated using robust regression methodology and the results compared. Robust regression allows for the correct weighting of outlier data points, reducing their effect on the regression coefficients. Robust regression utilizes a type of maximum likelihood to minimize the sum of the residuals. The method repeatedly estimates the model's coefficients and through an iterative process the coefficients are calculated until the sum of the residuals is at a minimum. This method of robust regression is well suited to deal with the problem of heteroskedasticity. By allowing the user to select the variable that weights the outliers a correction variable, the inverse of the logarithmic square of the ordinary least squares residuals can be calculated correcting the problem. The assumptions and limitations of robust regression are the same as those of the multiple regression models, with one exception. The weights of individual data points must be scrutinized because it is possible that the influence of some of the observations could be substantially reduced or eliminated entirely.

TECHNICAL RESULTS

Of the nine variables, seven independent variables and two dependent variables, only three of them are continuous. Descriptive statistics were calculated on all three non-binary variables and all three were found to exhibit normal distributions. Although none of the distributions exhibit any skewness, the market return for the S&P1200, the return for the DJIA and the return for the NASDAQ index are all strongly leptokurtic with kurtosis readings of 7.313, 9.364 and 17.918 respectively. This finding suggests that the daily return data for the three index portfolios are tightly centered on their mean. All normality tests supported by NCSS rejected normality for each non-binary variable at probability levels approaching zero.

The daily return data of the S&P1200 is highly clustered around zero with a mean of -.000353 and standard deviation of .0074 (95% confidence interval covers -.01093 to .007047) with a range of almost 10 percentage points. The NASDAQ mean proves to be very small at: -.000200498 with a standard deviation of .01314 (95% confidence interval covers -.0132 to .0128) with a range of 25 percentage points. Unlike the S&P1200 and the NASDAQ index, the mean for the DIJA is a positive number equaling .000392 (95% confidence interval covers -.007608 to .008392) with a range of 11%. The evidence of a zero expected mean and a variance of that mean that increases as a function of time bear out the expectations predicted by random walk theory.

A certain amount of correlation between the independent and dependent variables is desirable. Here, the correlation matrix indicates that all three non-binary variables are moderately correlated.

Table 1: Correlation Report

Pearson Correlations Section

	S & P 1200	DJIA	NASDAQ
S & P 1200	1.00000	-0.59736	-0.53614
DJIA	-0.59736	1.00000	0.55814
NASDAQ	-0.53614	0.55814	1.00000

These negative relationships are graphically depicted in the scatter plots of the S&P 1200 against the DJIA and NASDAQ in the appendix. Given as a point of reference the correlation between the market return of the NASDAQ and the NYSE is 0.558136. It is conceivable that the negative relationship between the two domestic market indexes and the more global S&P 1200 when compared to the positive correlation coefficients between the domestic indexes is due to the more global nature of the later index.

The scatterplots of each independent variable against the dependent variable exhibits the linear trend that exists between each of the variables. These scatterplots also show the existence of numerous outliers in the data set. This problem is exhibited clearly in the box-whisker graphics that follow. The existence of these outliers and their effect on the significance of the parameter estimates will be dealt with using robust regression to estimate the purposed models.

Following the methodology for robust regression, the first step is to estimate the models using ordinary least squares (OLS) methodology. For the purposes of this study the signs of coefficients are of secondary importance. All significant coefficients are important because they represent the effect the event has on the market. However, the S&P variable is expected to be positive in both models. The DJIA, the NASDAQ and the

S&P 1200 have had more days of growth then decline and it is expected that market indicators would move together. Significant dummy variables can be either positive or negative. It is conceivable that the market might react positively to an unexpected FOMC decision until market participants begin to engage in profit taking after which the effect would be negative. The OLS model for the DJIA shows that the market return for the S&P1200 was highly significant and that the dummy variable for the day following the announcement showed a mildly significant effect with a T - value of 2.8754 and a probability level of .004066. The OLS model for the NASDAQ shows that the S&P1200 variable is again highly significant and that the market expectations variable is marginally significant with a T – value of 2.0475 and a probability level of .040700.

Unlike most studies involving time series data, autocorrelation or serial correlation among the residuals proved to be largely nonexistent. Although the data sets used in this study are continuous time series data sets, the data points have been transformed. The original data set collected consisted of daily readings; opening and closing readings of the three indexes. This data set was then used to calculate daily market return on the index.

To test for the presence of heteroskedasticity, the predicted values of each model are regressed on the residuals of the model. If the residuals variable is found to be significant then the model suffers from heteroskedasticity. The regression of the residuals on the predicted OLS dependent variable produces insignificant results. The DJIA and the NASDAQ model show significant T – values of –1.27 and –1.32 with probability levels of .202 and 0.18 respectively. (Although the OLS models do not show any

indication of heteroskedasticity, the NASDAQ robust regression of the absolute values of the residuals on the predicted values show heteroskedasticity.) Because of the possible presence of heteroskedasticity and the numerous outliers the above models must be estimated using the robust regression described earlier and a weighting variable. The calculation of the weighting variable is:

(1) Estimation of equation using ordinary least squares methodology
(2) Take residuals from step one and calculate log (μ^2)
(3) Regress log (μ^2) on the independent variables of the model and obtain the fitted values: g
(4) Exponentiate the fitted values: g to get: h: h = exp(g)
(5) Estimate equation using robust regression and h = 1/g as the weighting variable

As expected the robust regression produces results that are significantly different from the ordinary least squares estimation. As stated previously, it is not the sign of the coefficient that is important but the significance of the dummy variables this is of interests. It is expected that the signs of the coefficients in robust regression would be the same as those in OLS regression. As with OLS estimation, both models have a highly significant S&P1200 variable. The robust regression using the DJIA as the dependent variable finds that not only is the dummy variable for the day following the announcement significant but that the 'day two' and 'day three' dummy variables are also significant with T – values of 4.4816, 2.3799 and –2.0178 with probability levels of .0000008, .017382 and .043710 respectably. It should be noted that at 95% the 'day three' dummy variable is significant but if that level were changed to 99% that variable would prove insignificant. The r-squared statistic for this model indicates that almost 50% of the variability in the dependent variable is explained. For the NASDAQ model,

the change from OLS to robust regression shows the market expectations variable becoming insignificant but the 'day five' dummy variable becomes significant with a T value of –2.9551 and a probability level of .003153. The r-squared statistic is similar in value to the DJIA statistic and shows that roughly 50% of the variability in the dependent variable is explained. Like the ordinary least squares estimation, the residuals still form a non-normal distribution, with the kurtosis of the residuals showing a highly leptokurtic distribution centered on zero. The DJIA model residuals and the NASDAQ model residuals have kurtosis readings of 6.42882 and 20.39107. The regression of the absolute value of the residuals produced in robust regression on the fitted 'Y' values indicates that the heteroskedasticity in the model has been alleviated or eliminated. The regression of the fitted 'Y' values on the absolute value of the residuals for the DIJA model is insignificant with a T – value of –1.3295 and a probability value of .183789. The regression of the fitted 'Y' values on the absolute value of the residuals for the NASDAQ model proves to be significant but only slightly. The T – value equals –2.3714 with a probability level of .017787. Again, if we were to rerun the estimation at 99% the NASDAQ regression of fitted values on the residuals would prove insignificant.

The results of this analysis indicated that there is some form of anomaly present. Of the two models presented, the DJIA model conforms more to the expectations and the theory of market efficiency. You have an event that lasts three days and then becomes insignificant. The effect of the event has a diminishing effect on the market return of the index as time goes on. The coefficients decrease from a .17% change on the day after to a .07% change in market return on the third day. The NASDAQ model does not conform as

nicely to the market expectations. If the results of this study are accepted, then the conclusion is that the effect of the event is not felt until the fifth day after an announcement. Given these results, an initial conclusion might be that the results indicate a denial of market efficiency. If the NASDAQ reaction actually occurred five days after the event then the quick response tenet of market efficiency would be violated. Market efficiency states that the lag in the response of the market to an event must be short enough to prevent profitable investing based on predictability. The existence of an effect on the fifth day might be an anomaly inherent to this particular data set. Since the event period identified in this study ends on the fifth day following an event it is unknown if the reaction extends beyond the end of the study period. A further course of study might be to see just how far out the effects of the NASDAQ model continue after the fifth day.

The real surprise is the insignificance of the market expectations variable. In both cases of robust regression, the variable that indicates when a surprise move by the FOMC has taken place, perhaps the greatest cause for volatility, has proven insignificant. This does not prove that the market is inefficient or that the market is rarely surprised by the policy making body. The market expectations variable was subject to some human decision-making and therefore is not completely derived from the market but is subjective in nature. The assignment of an event as either an unexpected or expected outcome was made on the assumption that if the market was factoring in a 30 percent chance of a certain movement and that factoring proved correct then the event was anticipated by the market. It was expected that this study would produce an identifiable anomaly. It was further hypothesized that the anomaly would be explained as the

occurrence of a surprise movement by a policy setting body. Given the derived definition of an unexpected event utilized in this study, the model simply fails to prove the hypothesis.

CONCLUSIONS

Caution must be taken when applying any single study to a macro theoretical argument. As stated, this study did not seek to define financial markets as efficient or inefficient. It merely sought to identify one more anomaly and present its evidence as part of the whole of the research done on the subject.

One of the main drawbacks to this particular study exists in the market expectations dummy variable. Since a precedent study could not be found a subjective choice was made: the choice of 30 percent as the dividing line between an expected outcome and an unexpected outcome. A further course of analysis might be the estimation of these models using different percentages as the guide for decision-making. The model could be re-estimated at given percentage intervals (intervals of 1, 2 or 2.5 percentage points) with the market expectations threshold starting at 25 percent and ending at 65 percent. This variation would show the expectations threshold of the market. A second subjective choice was made in the designation of the end date of the event period as the fifth day following an announcement. The effect of the rate decision could extend beyond this chosen end date. Extending the ending date of the event period to the day before the FOMC makes its next announcement would not only eliminate this shortcoming.

According to this study there is an anomalous reaction by broad market indexes to the decisions of the FOMC that cannot be explained by chance or randomness. Whether this is the result of the subjective manipulation of a market expectations indicator, a

problem in the data itself or simply the shortcomings of the particular methodology used in this study remains unanswered.

Happily, for the investment professional, there is some predictability in the market. Clearly, the potential reward to the investor who finds and successfully exploits an anomaly is limitless but there is not enough evidence to warrant rejection of market efficiency. No single study will be able to decide this issue; even considering the compelling weight of numerous studies done over time it is unlikely a consensus opinion will be reached.

APPENDIX

S&P Global 1200: Description

The S&P Global 1200 sets a new standard for global equity benchmarks. The S&P Global 1200 combines the features of a broad global portfolio with sufficient liquidity in the underlying equities, making the index ideally suited for index-related investment products. The S&P Global 1200 is the world's first real-time, free-float weighted index. The S&P Global 1200 covers approximately 70% of global market capitalization.

The S&P Global 1200 is comprised of six regional indices: S&P 500, S&P/TSE 60 (Canada), S&P Latin America 40, S&P/TOPIX 150 (Japan), S&P Asia Pacific 100 and S&P Europe 350. Constituents for each index are selected to ensure sectoral and, when applicable, country balance. Constituent weights are determined by a company's free-float market capitalization. Free-float means that we remove corporate cross-holdings, government ownership, strategic holders and foreign investment restrictions.

Defining the S&P Global 1200

The S&P Global 1200 Index is comprised of six distinct, regional, component indices: US - S&P 500, Canada - S&P/TSE 60, S&P Latin America 40, Japan - S&P/TOPIX 150, S&P Asia Pacific 100, and the S&P Europe 350. The S&P Global 1200 represents the opportunity set of investable equities around the globe. Each regional benchmark is constructed in a similar manner to the S&P 500 with the addition of a float-adjustment factor. The size of each region corresponds to its relative size in the global equity market based on adjusted market value. The S&P Global 1200 is the first global index to be calculated in real time.

Float-Adjusted Market value: When calculating index weights, individual constituents' shares held by governments, corporations, strategic partners, or other control groups are excluded from the company's shares outstanding. Shares owned by other companies are also excluded regardless of whether they are index constituents.

In countries with regulated environments, where a foreign investment limit exists at the sector or company level, the constituent's weight will reflect either the foreign investment limit or the percentage float, whichever is the more restrictive.

Liquidity: Stocks are ranked according to liquidity measured by dollar value traded. Value traded and float turnover are also analyzed on a monthly basis to ensure ample liquidity.

Sector Classification: Standard & Poor's has mapped stocks to the Global Industry Classification Standard (GICS). The S&P Global 1200 index provides geographic and economic balance over the 10 GICS market sectors. These sectors, consistent throughout all the S&P indices, include Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Telcom

Services, and Utilities. Standard & Poor's classifies a stock according to the source of its largest revenue share.

Fundamental Analysis: The financial and operating condition of a company are rigorously analyzed. Keeping in mind the goal of minimizing index turnover, the financial stability of index constituents is a major consideration.

Revisions to the Float Adjustments: Once a year, the float adjustments will be reviewed. Each company's financial statements will be used to update the major shareholders' ownership.

Quarterly Index Rebalancing: Changes in the number of shares outstanding driven by corporate events such as stock dividends, splits, and rights issues will be adjusted on the ex-date. Share changes of 5% or greater are implemented when they occur. All share changes of less than 5% are updated on a quarterly basis (third Friday of March, June, September, and December or at the close of the expiry of futures contracts). Implementation of new additions, deletions, and changes to the float adjustment, due to corporate actions, will be made available at the close of the third Friday in March, June, September and December. Generally, index changes, due to rebalancing, are announced 10 days before the effective date by way of a news release posted on www.spglobal.com.

Real-Time Calculation

The S&P Global 1200 calculation begins as soon as the first quote for any index constituent is received. The index is calculated until 5:15pm ET to allow for last minute revisions by regional stock exchanges that are the last to close (U.S., Canada, and Mexico).

At the country level, the opening price is the first trade of any stock, in the event a stock does not open the previous closing price or adjusted price in the region will be used. The closing index value is calculated using the closing price of each stock in its primary market.

Base Date: The S&P Global 1200 was based at December 31, 1997. Base value = 1000.

Federal Funds Rate

The owner of a federal funds futures contract is obliged to take delivery of the interest paid on a principal amount of $5 million overnight fed funds held for 30 days. The price of the contract, called a 30-Day Fed Funds Futures, is equal to 100 minus the average federal funds rate during the contract month. The calculation of the market expectations probability indicator (see table in appendix) is a ratio of market expectations to possible outcomes. For example, a 4.50 percent rate equals 95.50 the price of these contracts implies expectations for the fed funds rate. For example, suppose the fed funds rate is currently 8.5% and next months fed funds futures contract is trading at 91.46. The price implies an average fed funds rate during the month of 8.54%. Also suppose that the Fed meets on the 20th of the contract month, a 30-day month. If at it's meeting the Fed raises the fed funds rate from 8.5% to 8.75%, the average rate for the month would be 8.58%.

The calculation is as follows for possible outcomes is:

(8.5% * 20 days) + (8.75% * 10 days) / 30 days = (170% + 87.5%)/30 = 167.50% / 30 = 8.58%

The key point here is that a 25-basis point rate hike by the Fed would produce an average fed funds rate for the month just 8 basis points higher than the current rate of 8.5 percent. So a fed funds futures contract pricing in an average rate of 8.54 percent for the month is pricing in 4 of the 8 basis points by which the average rate would rise in the event of a 25 basis point hike. Because 4/8 = 50 percent, we say the contract is pricing in a 50 percent chance of a rate hike.

Expectations Probability Table								
Meeting	Greenspan Decision			Calculation of Probability				Surprise
Date	Pre	Post	Change	Plus 50	Plus 25	Minus 50	Minus 25	Dummy
3/20/01	5.50	5.00	-0.05			51.2727%	102.5455%	0
1/31/01	6.00	5.50	-0.05			8.0000%	16.0000%	1
1/3/01	6.50	6.00	-0.05			27.9643%	55.9286%	1
12/19/00	6.50	6.50	0.00			8.6667%	17.3333%	0
11/16/00	6.50	6.50	0.00	3.2143%	6.4286%			0
10/4/00	6.50	6.50	0.00	93.333%	186.6667%			1
8/23/00	6.50	6.50	0.00			1.1250%	2.2500%	0
6/29/00	6.50	6.50	0.00	6.0000%	12.0000%			0
5/17/00	6.00	6.50	0.50	49.285%	98.5714%			0
3/22/00	5.75	6.00	0.25	23.333%	46.6667%			0
2/2/00	5.50	5.75	0.25			11.4231%	22.8462%	1
12/21/99	5.50	5.50	0.00			14.3000%	28.6000%	0
11/16/99	5.25	5.50	0.25	20.357%	40.7143%			0
10/5/99	5.25	5.25	0.00	9.3462%	18.6923%			0
8/24/99	5.00	5.25	0.25	13.714%	27.4286%			1
6/30/99	4.75	5.00	0.25	12.000%	24.0000%			1
5/18/99	4.75	4.75	0.00	9.6923%	19.3846%			0
3/30/99	4.75	4.75	0.00	26.000%	52.0000%			1
2/3/99	4.75	4.75	0.00			5.2000%	10.4000%	0
12/22/98	4.75	4.75	0.00	15.555%	31.1111%			0
11/17/98	5.00	4.75	-0.25			15.0769%	30.1538%	0
10/15/98	5.25	5.00	-0.25			11.6875%	23.3750%	1
9/29/98	5.50	5.25	-0.25			2.0000%	4.0000%	1
8/18/98	5.50	5.50	0.00	6.4615%	12.9231%			0
7/1/98	5.50	5.50	0.00	4.1333%	8.2667%			0
5/19/98	5.50	5.50	0.00			0.0000%	0.0000%	0
3/31/98	5.50	5.50	0.00	4.0000%	8.0000%			0
2/4/98	5.50	5.50	0.00			5.2083%	10.4167%	0
12/16/97	5.50	5.50	0.00	19.200%	38.4000%			1
11/12/97	5.50	5.50	0.00	14.777%	29.5556%			0
9/30/97	5.50	5.50	0.00	24.000%	48.0000%			1
8/19/97	5.50	5.50	0.00	3.2500%	6.5000%			0
7/2/97	5.50	5.50	0.00	10.344%	20.6897%			0
5/20/97	5.50	5.50	0.00	12.000%	24.0000%			0
3/25/97	5.25	5.50	0.25	18.667%	37.3333%			0
2/5/97	5.25	5.25	0.00	8.3478%	16.6957%			0
12/17/96	5.25	5.25	0.00	24.649%	49.2857%			1

11/13/96	5.25	5.25	0.00	7.4118%	14.8235%			0
9/24/96	5.25	5.25	0.00	14.000%	28.0000%			0
8/20/96	5.25	5.25	0.00	3.2727%	6.5455%			0
7/3/96	5.25	5.25	0.00	29.000%	58.0000%			1
5/21/96	5.25	5.25	0.00			1.1000%	2.2000%	0
3/26/96	5.25	5.25	0.00	27.600%	55.2000%			1
1/31/96	5.50	5.25	-0.25	30.000%	60.0000%			1
12/19/95	5.75	5.50	-0.25			2.1667%	4.3333%	1
11/15/95	5.75	5.75	0.00			7.4667%	14.9333%	0
9/26/95	5.75	5.75	0.00			0.0000%	0.0000%	0
8/22/95	5.75	5.75	0.00			2.2222%	4.4444%	0
7/6/95	6.00	5.75	-0.25			29.1200%	58.2400%	0
5/23/95	6.00	6.00	0.00	2.2500%	4.5000%			0
3/28/95	6.00	6.00	0.00			8.0000%	16.0000%	0
2/1/95	5.50	6.00	0.50	95.407%	190.8148%			0
12/20/94	5.50	5.50	0.00	28.363%	56.7273%			1
11/15/94	4.75	5.50	0.75	76.800%	153.6000%			0
9/27/94	4.75	4.75	0.00	4.1176%	8.2353%			0
8/16/94	4.25	4.75	0.50	40.533%	81.0667%			0
7/6/94	4.25	4.25	0.00	33.280%	66.5600%			1
5/17/94	3.75	4.25	0.50	40.714%	81.4286%			0
4/18/94	3.50	3.75	0.25	13.000%	26.0000%			1
3/22/94	3.25	3.50	0.25	20.000%	40.0000%			0
2/4/94	3.00	3.25	0.25	35.416%	70.8333%			0
12/21/93	3.00	3.00	0.00	6.6000%	13.2000%			0
11/16/93	3.00	3.00	0.00	6.4286%	12.8571%			0
9/23/93	3.00	3.00	0.00	16.000%	32.0000%			1
8/17/93	3.00	3.00	0.00	12.857%	25.7143%			0
7/7/93	3.00	3.00	0.00	8.3333%	16.6667%			0
5/18/93	3.00	3.00	0.00			2.1538%	4.3077%	0
3/23/93	3.00	3.00	0.00	15.750%	31.5000%			0
2/3/93	3.00	3.00	0.00	12.480%	24.9600%			0
12/22/92	3.00	3.00	0.00	13.333%	26.6667%			0
11/17/92	3.00	3.00	0.00	10.769%	21.5385%			0
10/6/92	3.00	3.00	0.00			12.4800%	24.9600%	0
9/4/92	3.25	3.00	-0.25			8.3077%	16.6154%	1
8/18/92	3.25	3.25	0.00	2.1538%	4.3077%			0
7/2/92	3.75	3.25	-0.50			16.5517%	33.1034%	1
5/19/92	3.75	3.75	0.00	10.833%	21.6667%			0
4/9/92	4.00	3.75	-0.25			0.0000%	0.0000%	1
3/31/92	4.00	4.00	0.00			0.0000%	0.0000%	0
2/5/92	4.00	4.00	0.00			4.1667%	8.3333%	0

12/20/91	4.50	4.00	-0.50	24.000%	48.0000%			1
12/6/91	4.75	4.50	-0.25			4.1600%	8.3200%	1
11/6/91	5.00	4.75	-0.25			10.4167%	20.8333%	1
10/31/91	5.25	5.00	-0.25			8.0000%	16.0000%	1
9/13/91	5.50	5.25	-0.25			2.1176%	4.2353%	1
8/6/91	5.75	5.50	-0.25			2.0800%	4.1600%	1
7/3/91	5.75	5.75	0.00	29.000%	58.0000%			1
5/14/91	5.75	5.75	0.00	4.2353%	8.4706%			0
4/30/91	6.00	5.75	-0.25			28.0000%	56.0000%	0
3/26/91	6.00	6.00	0.00	48.000%	96.0000%			1
3/8/91	6.25	6.00	-0.25	18.782%	37.5652%			0
2/1/91	6.75	6.25	-0.50			24.8889%	49.7778%	1
1/9/91	7.00	6.75	-0.25			33.4545%	66.9091%	0
12/18/90	7.25	7.00	-0.25	60.307%	120.6154%			1
12/7/90	7.50	7.25	-0.25	39.583%	79.1667%			1
11/13/90	7.75	7.50	-0.25	10.588%	21.1765%			1
10/29/90	8.00	7.75	-0.25	21.000%	42.0000%			1
10/2/90	8.00	8.00	0.00			18.6000%	37.2000%	1
8/21/90	8.00	8.00	0.00	22.000%	44.0000%			1
7/13/90	8.25	8.00	-0.25			4.2222%	8.4444%	1
7/3/90	8.25	8.25	0.00			8.2857%	16.5714%	0
5/15/90	8.25	8.25	0.00			2.1250%	4.2500%	0
3/27/90	8.25	8.25	0.00	7.5000%	15.0000%			0
2/7/90	8.25	8.25	0.00			6.2857%	12.5714%	0

NCSS Analysis Output
Descriptive Statistics Report:S & P 1200

Summary Section of MR1200

Count	Mean	Minimum	Maximum	Range
2807	-3.535777E-04	-4.995613E-02	5.003545E-02	9.999E-02

Means Section of MR1200

Parameter	Mean	Median	Sum
Value	-3.535777E-04	-5.140672E-04	-0.9924927
Std Error	1.46099E-04		0.4101
95% LCL	-6.399266E-04	-6.958229E-04	-1.796274
95% UCL	-6.722886E-05	-3.015058E-04	-0.1887114
T-Value	-2.4201		
Prob Level	0.015578		
Count	2807		

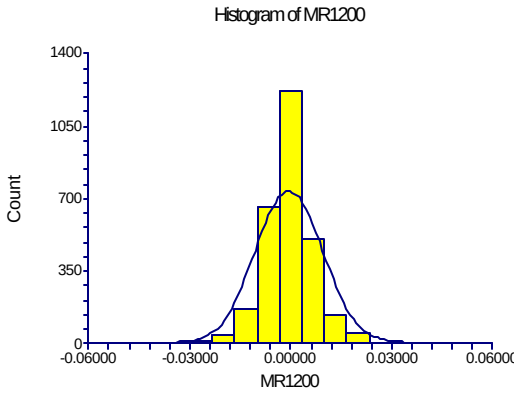
Skewness and Kurtosis Section of MR1200

Parameter	Skewness	Kurtosis
Value	0.2016575	7.313138
Std Error	0.2007883	0.7749611

Normality Test Section of MR1200

Test Name	Test Value	Prob Level	Decision Value (5%)
Shapiro-Wilk W	0.9544791	0.000000	Reject Normality
Anderson-Darling	23.81435	0.000000	Reject Normality
Martinez-Iglewicz	1.332041		Reject Normality
Kolmogorov-Smirnov	6.355017E-02		Reject Normality
D'Agostino Skewness	4.3304 0.000015		Reject Normality
D'Agostino Kurtosis	16.7367	0.000000	Reject Normality
D'Agostino Omnibus	298.8686	0.000000	Reject Normality

Plots Section of MR1200



Descriptive Statistics: Dow Jones Industrial Average

Summary Section of MRNYSE

Count	Mean	Minimum	Maximum	Range
2807	3.921826E-04	-6.682758E-02	0.048424	0.1152516

Means Section of MRNYSE

Parameter	Mean	Median	Sum
Value	3.921826E-04	3.905572E-04	1.100857
Std Error	1.510284E-04		0.4239368
95% LCL	9.617232E-05	1.685062E-04	0.2699557
95% UCL	6.881929E-04	7.106946E-04	1.931757
T-Value	2.5967		
Prob Level	0.009460		
Count	2807		

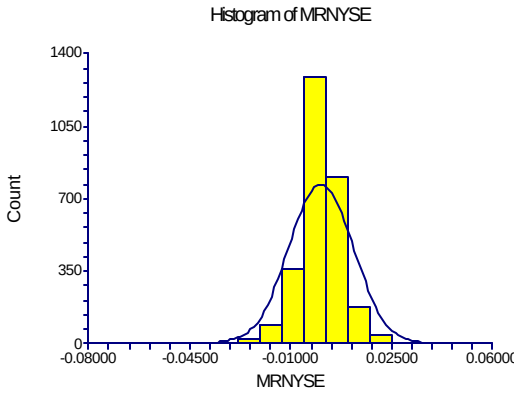
Skewness and Kurtosis Section of MRNYSE

Parameter	Skewness	Kurtosis
Value	-0.5125272	9.36409
Std Error	0.2881077	1.652837

Normality Test Section of MRNYSE

Test Name	Test Value	Prob Level	Decision (5%)
Shapiro-Wilk W	0.9405974	0.000000	Reject Normality
Anderson-Darling	29.2746	0.000000	Reject Normality
Martinez-Iglewicz	1.378598		Reject Normality
Kolmogorov-Smirnov	6.652962E-02		Reject Normality
D'Agostino Skewness	-10.4949	0.000000	Reject Normality
D'Agostino Kurtosis	19.3949	0.000000	Reject Normality
D'Agostino Omnibus	486.3036	0.000000	Reject Normality

Plots Section of MRNYSE



Descriptive Statistics: NASDAQ

Summary Section of MRNASDAQ

Count	Mean	Minimum	Maximum	Range
2807	-2.004987E-04	-8.957037E-02	0.1606211	0.2501915

Means Section of MRNASDAQ

Parameter	Mean	Median	Sum
Value	2.004987E-04	5.538632E-04	-0.5627999
Std Error	2.481505E-04		0.6965585
95% LCL	-6.868648E-04	2.38781E-04	-1.928029
95% UCL	2.858673E-04	9.270241E-04	0.8024296
T-Value	-0.8080		
Prob Level	0.419175		
Count	2807		

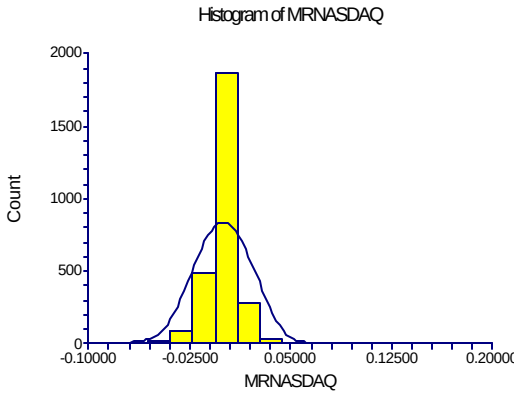
Skewness and Kurtosis Section of MRNASDAQ

Parameter	Skewness	Kurtosis
Value	0.3113253	17.91815
Std Error	0.6718342	6.15386

Normality Test Section of MRNASDAQ

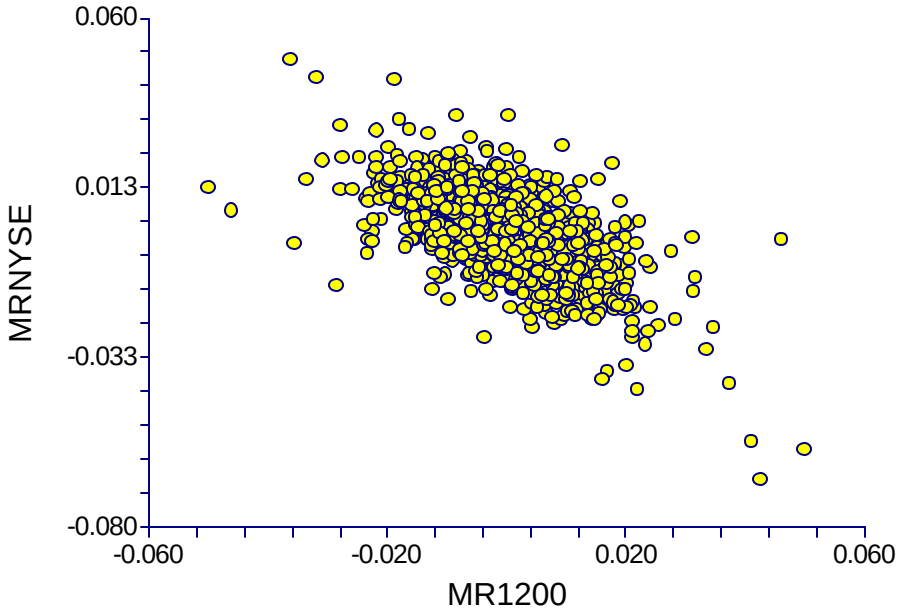
Test Name	Test Value	Prob Level	Decision (5%)
Shapiro-Wilk W	0.8650284	0.000000	Reject Normality
Anderson-Darling	75.90972	0.000000	Reject Normality
Martinez-Iglewicz	1.990831		Reject Normality
Kolmogorov-Smirnov	0.109739		Reject Normality
D'Agostino Skewness	6.5991	0.000000	Reject Normality
D'Agostino Kurtosis	24.7868	0.000000	Reject Normality
D'Agostino Omnibus	657.9323	0.000000	Reject Normality

Plots Section of MRNASDAQ

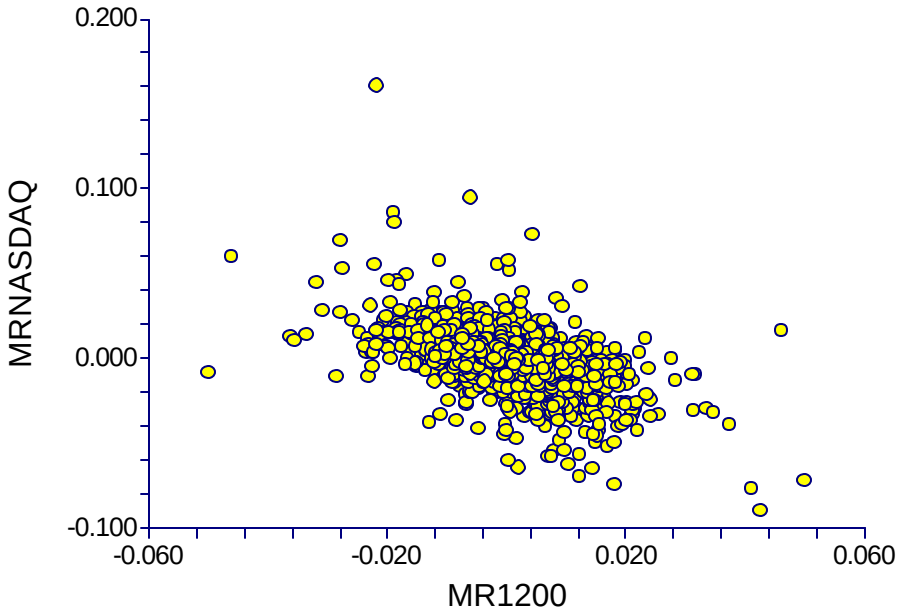


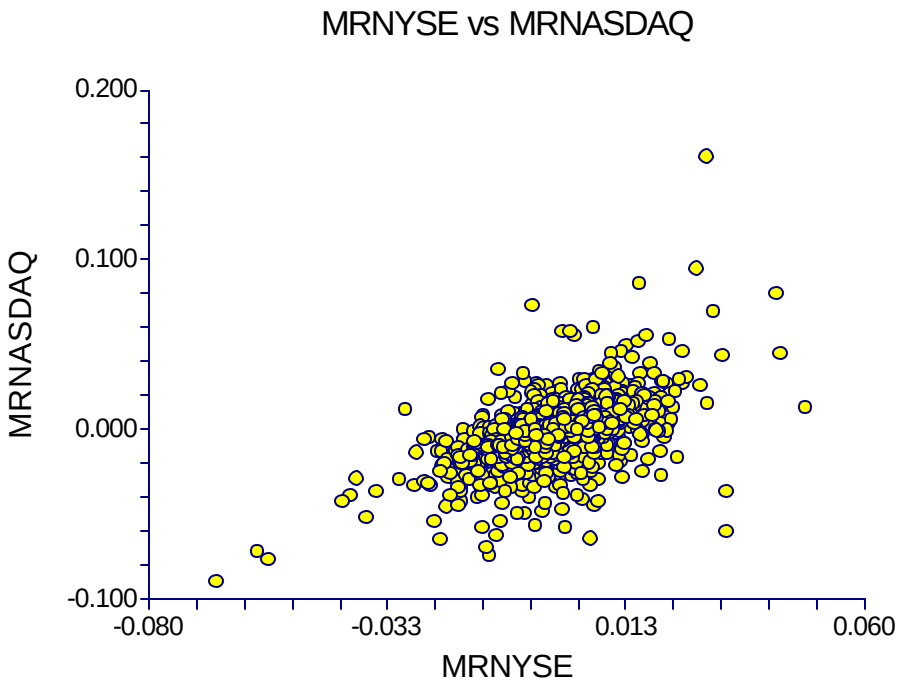
Scatter Plot Sections

MR1200 vs MRNYSE

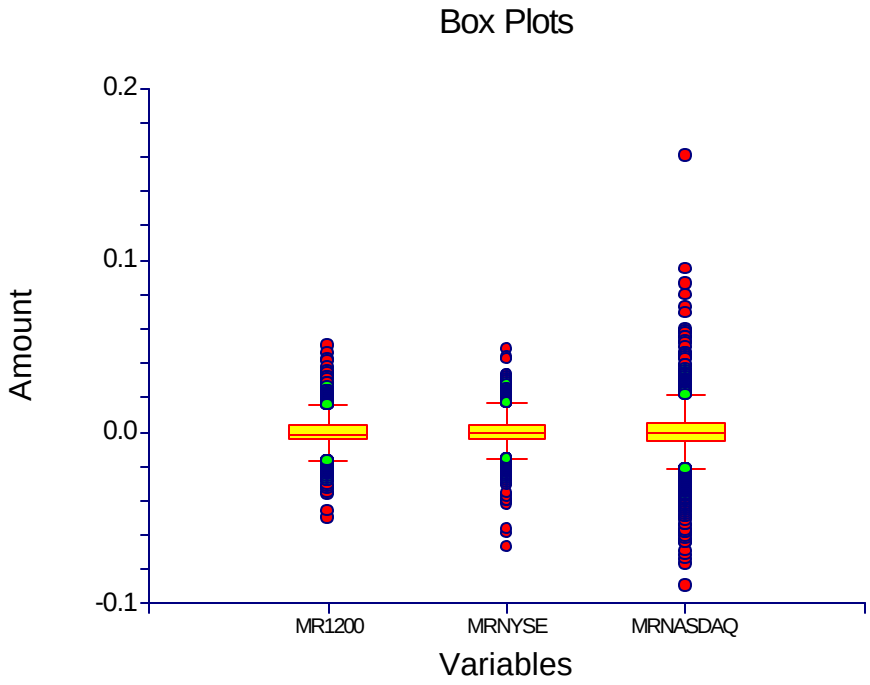


MR1200 vs MRNASDAQ




MRNYSE vs MRNASDAQ
0.200
0.100
0.000
-0.100
MRNASDAQ
-0.080
-0.033
0.013
0.060
MRNYSE

Box Whisker Plot



Multiple Regression Reports: NASDAQ

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
MR1200	2807	-3.535777E-04	7.740492E-03
Suprise	2807	1.389384E-02	0.1170713
MRNASDAQ	2807	-2.004987E-04	1.314729E-02

Correlation Matrix Section

	MR1200	Suprise	MRNASDAQ
MR1200	1.000000	-0.052073	-0.536140
Suprise	-0.052073	1.000000	0.065353
MRNASDAQ	-0.536140	0.065353	1.000000

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level
MR1200	-0.90439	2.7096E-02	-33.37	0.000
Suprise	3.6465E-03	1.7809E-03	2.047	0.040
R-Squared	0.287101			

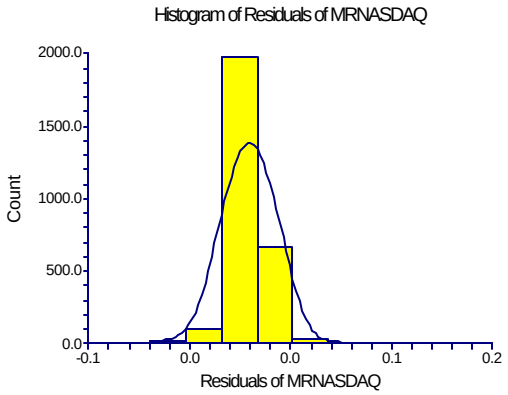
Model

-.9043956*MR1200+ 3.646538E-03*Suprise

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
MR1200	-0.9043956	2.709697E-02	-0.9575047	-0.8512865
Suprise	3.646538E-03	1.780958E-03	1.559253E-04	7.137151E-03
T-Critical	1.959964			

Plots Section



Descriptive Summary Section of NASDAQ model residuals

Count	Mean	Standard Deviation	Standard Error
2807	-5.709373E-04	0.0110873	2.092688E-04

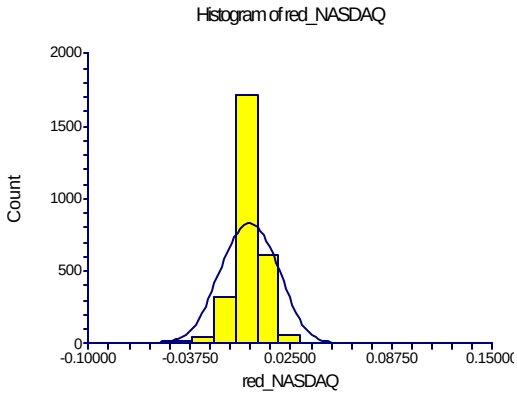
Means Section of red_NASDAQ

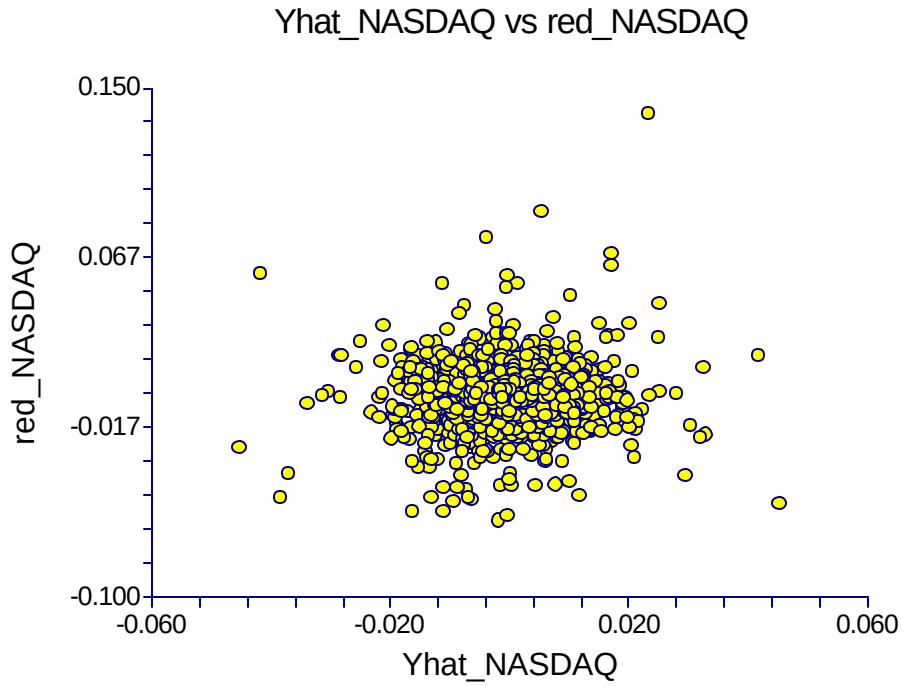
Parameter	Mean	Median	Sum
Value	-5.709373E-04	-9.89441E-05	-1.602621
Std Error	2.092688E-04		0.5874175
95% LCL	-9.810965E-04	-4.616395E-04	-2.753938
95% UCL	-1.60778E-04	2.571548E-04	-0.4513037
T-Value	-2.7282		
Prob Level	0.006407		
Count	2807		

Normality Test Section of red_NASDAQ

Test Name	Test Value	Prob Level	Decision (5%)
Shapiro-Wilk W	0.8670993	0.000000	Reject Normality
Anderson-Darling	67.47802	0.000000	Reject Normality
Martinez-Iglewicz	1.91443		Reject Normality
Kolmogorov-Smirnov	9.926774E-02		Reject Normality
D'Agostino Skewness	13.5805	0.000000	Reject Normality
D'Agostino Kurtosis	25.1224	0.000000	Reject Normality
D'Agostino Omnibus	815.5664	0.000000	Reject Normality

Plots Section of red_NASDAQ





Multiple Regression Reports: NYSE

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
MR1200	2807	-3.535777E-04	7.740492E-03
Dummy1	2807	3.633773E-02	0.1871624
MRNYSE	2807	3.921826E-04	8.001657E-03

Correlation Matrix Section

	MR1200	**Dummy1**	**MRNYSE**
MR1200	1.000000	-0.035118	-0.597355
Dummy1	-0.035118	1.000000	0.061065
MRNYSE	-0.597355	0.061065	1.000000

Regression Equation Section

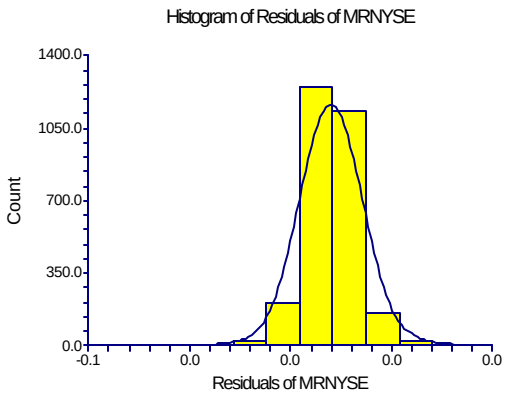
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level
MR1200	-0.6165949	1.563429E-02	-39.4386	0.000000
Dummy1	1.826997E-03	6.353945E-04	2.8754	0.004066
R-Squared	0.359792			

Model
-.6165949*MR1200+ 1.826997E-03*Dummy1

Regression Coefficient Section

Independent **Variable**	Regression **Coefficient**	Standard **Error**	Lower **95% C.L.**	Upper **95% C.L.**
MR1200	-0.6165949	1.563429E-02	-0.6472375	-0.5859522
Dummy1	1.826997E-03	6.353945E-04	5.816472E-04	3.072348E-03
T-Critical	1.959964			

Plots Section



Descriptive Summary Section of NYSE model residuals

Count	Mean	Standard Deviation	Standard Error
2807	1.077795E-04	6.409147E-03	1.209704E-04

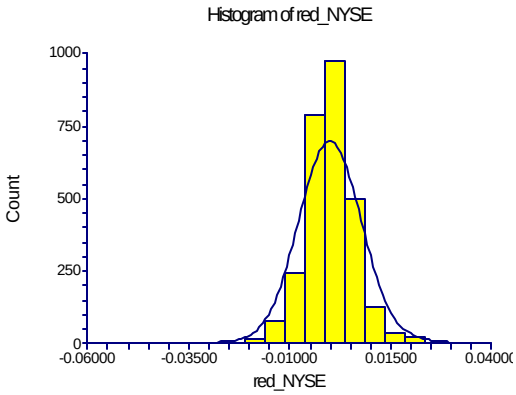
Means Section of red_NYSE

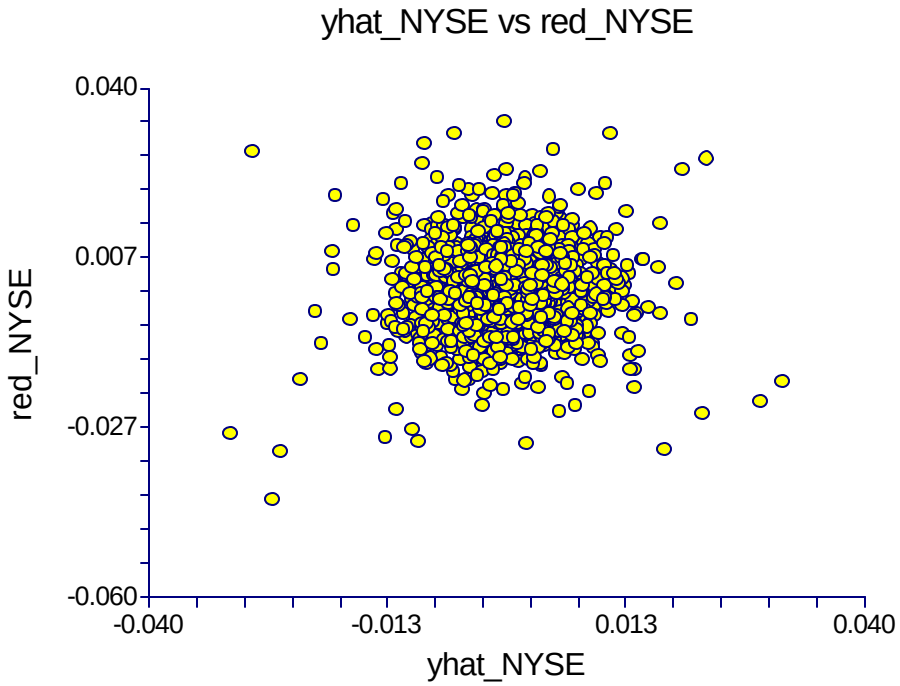
Parameter	Mean	Median	Sum
Value	1.077795E-04	3.203053E-05	0.302537
Std Error	1.209704E-04		0.3395638
95% LCL	-1.293181E-04	-2.15355E-04	-0.362996
95% UCL	3.44877E-04	2.606025E-04	0.9680699
T-Value	0.8910		
Prob Level	0.373028		
Count	2807		

Normality Test Section of red_NYSE

Test Name	Test Value	Prob Level	Decision (5%)
Shapiro-Wilk W	0.965424	0.000000	Reject Normality
Anderson-Darling	16.37704	0.000000	Reject Normality
Martinez-Iglewicz	1.267149		Reject Normality
Kolmogorov-Smirnov	4.816442E-02		Reject Normality
D'Agostino Skewness	0.1759	0.860391	Accept Normality
D'Agostino Kurtosis	14.8062	0.000000	Reject Normality
D'Agostino Omnibus	219.2546	0.000000	Reject Normality

Plots Section of red_NYSE





Heteroskedasticity Tests: NASDAQ

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
abs_resd_nasdaq	2807	7.142909E-03	8.481036E-03
Yhat_NASDAQ	2807	3.704386E-04	7.035626E-03

Correlation Matrix Section

	abs_resd_nasdaq	Yhat_NASDAQ
abs_resd_nasdaq	1.000000	-0.077154
Yhat_NASDAQ	-0.077154	1.000000

Regression Equation Section

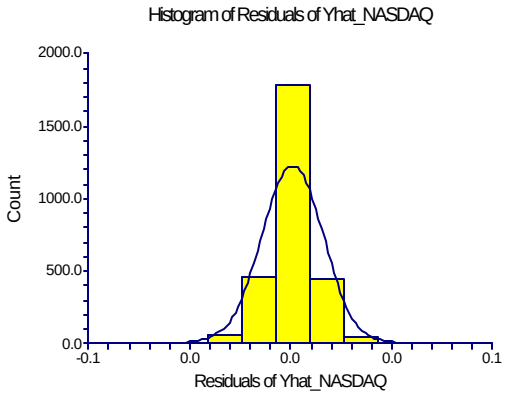
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level
abs_resd_nasdaq	-1.591326E-02	1.199028E-02	-1.3272	0.184557
R-Squared	0.000627			

Model
-1.591326E-02*abs_resd_nasdaq

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
abs_resd_nasdaq	-1.591326E-02	1.199028E-02	-3.941377E-02	7.587251E-03
T-Critical	1.959964			

Plots Section



Heteroskedasticity Tests: NYSE

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
abs_resd_nyse	2807	4.677778E-03	4.370352E-03
yhat_NYSE	2807	2.844031E-04	4.796944E-03

Correlation Matrix Section

	abs_resd_nyse	yhat_NYSE
abs_resd_nyse	1.000000	-0.098758
yhat_NYSE	-0.098758	1.000000

Regression Equation Section

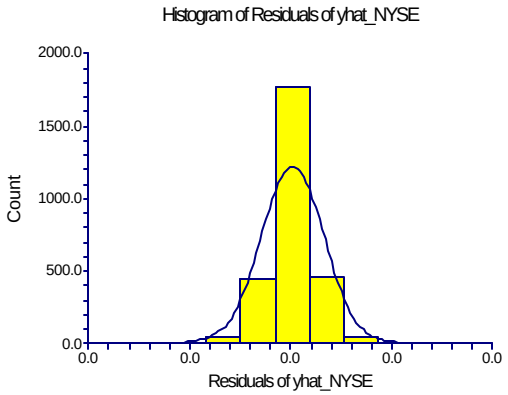
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level
abs_resd_nyse	-1.804259E-02	1.416517E-02	-1.2737	0.202865
R-Squared	0.000578			

Model
-1.804259E-02*abs_resd_nyse

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
abs_resd_nyse	-1.804259E-02	1.416517E-02	-4.580582E-02	9.720637E-03
T-Critical	1.959964			

Plots Section



Heteroskedasticity Tests: Robust Regression – NASDAQ

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
absrobust - red-nasdaq	2807	7.102104E-03	8.598566E-03
Robust-Yhat-NASDAQ	2807	2.174616E-04	6.015468E-03

Correlation Matrix Section

	absrobust-red-nasdaq	Robust-Yhat-NASDAQ
absrobust - red-nasdaq	1.000000	-0.087918
Robust-Yhat-NASDAQ	-0.087918	1.000000

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=O)	Prob Level
absrobust - red - nasdaq	-2.413716E-02	1.017832E-02	-2.3714	0.017787
R-Squared	0.002000			

Model
-2.413716E-02*absrobust-red-nasdaq

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error
absrobust - red-nasdaq	-2.413716E-02	1.017832E-02
T-Critical	1.959964	

Heteroskedasticity Tests: Robust Regression - NYSE

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
absrobust - red_nyse	2807	4.676051 E-03	4.389618E-03
Robust-Yhat-NYSE	2807	2.732744E-04	4.461703E-03

Correlation Matrix Section

	absrobust-red-nyse	Robust-Yhat-NYSE
absrobust - red_nyse	1.000000	-0.102000
Robust-Yhat-NYSE	-0. 1 02000	1.000000

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=O)	Prob Level
absrobust - red - nyse	1.748564E-02	1.315197E-02	-1.3295	0.183789
R-Squared	0.000630			

Model
-1.748564E-02*absrobust_red_nyse

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error
absrobust red nyse	-1.748564E-02	1.315197E-02
T-Critical	1.959964	

Robust Regression: NASDAQ

Descriptive Statistics Section

Variable	**Count**	**Mean**	Standard **Deviation**
MR1200	2742	-7.508432E-04	5.530164E-03
Dummy5	2742	3.536224E-02	0.1557994
MRNASDAQ	2742	6.244903E-04	6.136645E-03

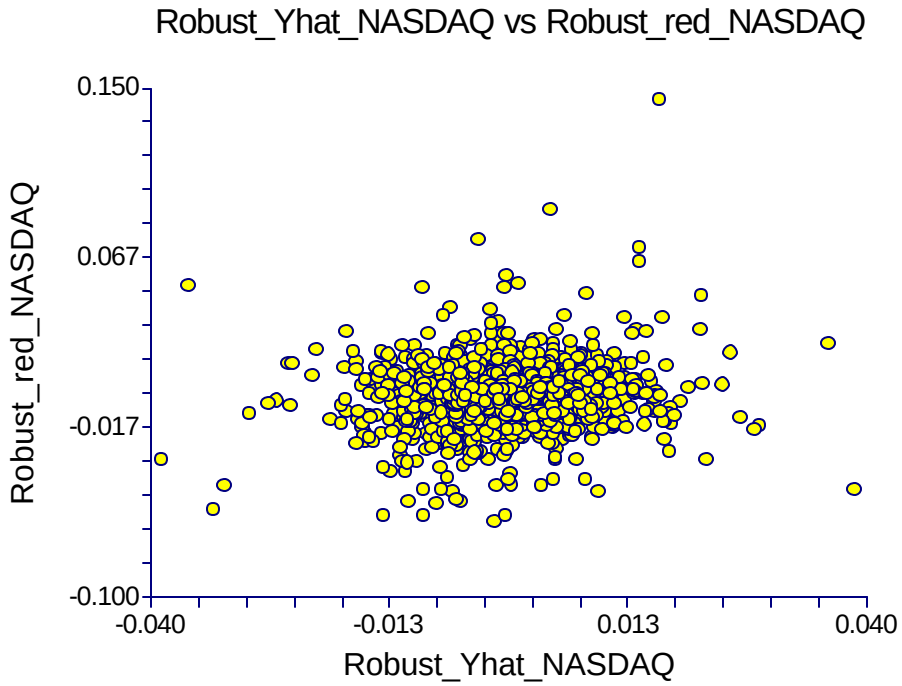
Regression Equation Section

Independent **Variable**	Regression **Coefficient**	Standard **Error**	T-Value **(Ho: B=0)**	Prob **Level**
MR1200	-0.7756441	1.507148E-02	-51.4643	0.000000
Dummy5	-1.562807E-03	5.288596E-04	-2.9551	0.003153
R-Squared	0.491869			

Model
-.7756441*MR1200-1.562807E-03*Dummy5

Regression Coefficient Section

Independent Variable	**Regression Coefficient**	**Standard Error**	**Lower 95% C.L.**	**Upper 95% C.L.**
MR1200	-0.7756441	1.507148E-02	-0.8051836	-0.7461045
Dummy5	-1.562807E-03	5.288596E-04	-2.599353E-03	-5.262612E-04
T-Critical	1.959964			



Descriptive Summary Section of NASDAQ Robust Regression Residuals

Count	Mean	Standard Deviation	Standard Error
2807	-4.179603E-04	1.114533E-02	2.103642E-04

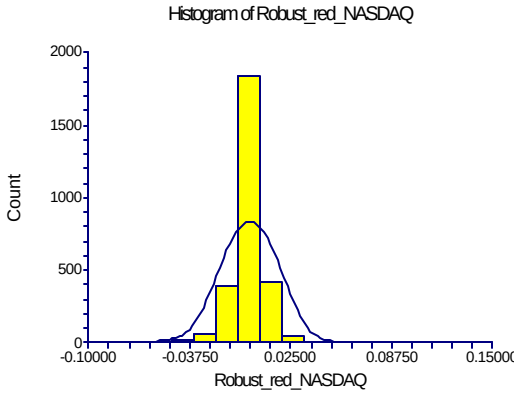
Means Section of Robust_red_NASDAQ

Parameter	Mean	Median	Sum
Value	-4.179603E-04	7.409741E-05	-1.173215
Std Error	2.103642E-04		0.5904924
95% LCL	-8.302666E-04	-2.269426E-04	-2.330558
95% UCL	-5.65405E-06	4.25906E-04	-1.587092E-02
T-Value	-1.9868		
Prob Level	0.047037		
Count	2807		

Normality Test Section of Robust_red_NASDAQ

Test Name	Test Value	Prob Level	Decision (5%)
Shapiro-Wilk W	0.8586966	0.000000	
Anderson-Darling	73.30135	0.000000	
Martinez-Iglewicz	1.98298		Reject Normality
Kolmogorov-Smirnov	0.1025472		Reject Normality
D'Agostino Skewness	14.1079	0.000000	Reject Normality
D'Agostino Kurtosis	25.6663	0.000000	Reject Normality
D'Agostino Omnibus	857.7927	0.000000	Reject Normality

Plots Section of Robust_red_NASDAQ



Robust Regression:NYSE

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation
MR1200	2787	-6.379405E-04	5.711995E-03
Dummy1	2787	3.465883E-02	0.1552875
Dummy2	2787	3.580637E-02	0.1577435
Dummy3	2787	3.822644E-02	0.1627824
MRNYSE	2787	4.92964E-04	4.673494E-03

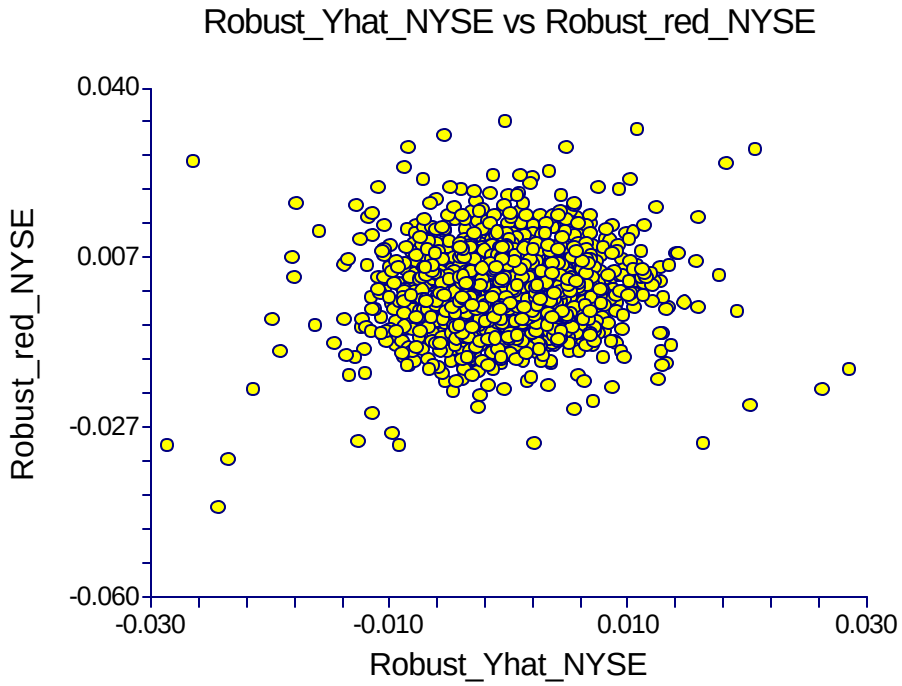
Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level
MR1200	-0.5721242	1.098187E-02	-52.0972	0.000000
Dummy1	1.785587E-03	3.984272E-04	4.4816	0.000008
Dummy2	9.328658E-04	3.9197E-04	2.3799	0.017382
Dummy3	-7.650006E-04	3.791301E-04	-2.0178	0.043710
R-Squared	0.499413			

Model
-.5721242*MR1200+ 1.785587E-03*Dummy1+ 9.328658E-04*Dummy2-7.650006E-04*Dummy3

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
MR1200	-0.5721242	1.098187E-02	-0.5936483	-0.5506001
Dummy1	1.785587E-03	3.984272E-04	1.004684E-03	2.56649E-03
Dummy2	9.328658E-04	3.9197E-04	1.646186E-04	1.701113E-03
Dummy3	-7.650006E-04	3.791301E-04	-1.508082E-03	-2.191935E-05
T-Critical	1.959964			



Descriptive Summary Section of NYSE Robust Regression Residuals

Count	Mean	Standard Deviation	Standard Error
2807	1.189082E-04	6.413099E-03	1.21045E-04

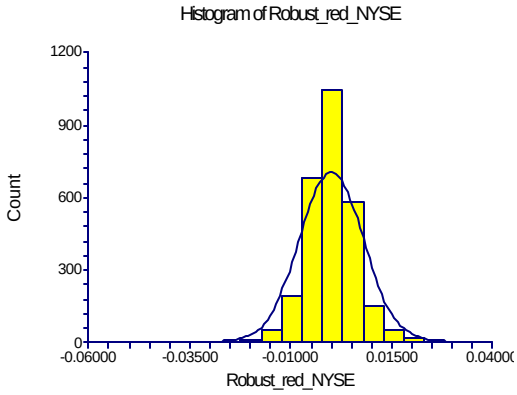
Means Section of Robust_red_NYSE

Parameter	Mean	Median	Sum
Value	1.189082E-04	1.475707E-04	0.3337754
Std Error	1.21045E-04		0.3397732
95% LCL	-1.183355E-04	-1.482529E-04	-0.3321679
95% UCL	3.56152E-04	3.377555E-04	0.9997187
T-Value	0.9823		
Prob Level	0.326013		
Count	2807		

Normality Test Section of Robust_red_NYSE

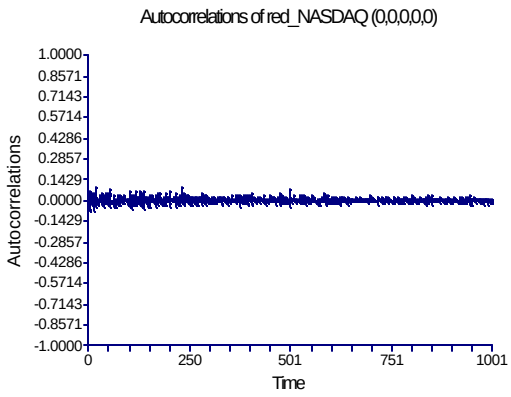
	Test	Prob	Decision
Test Name	Value	Level	(5%)
Shapiro-Wilk W	0.9642898	0.000000	Reject Normality
Anderson-Darling	16.7492	0.000000	Reject Normality
Martinez-Iglewicz	1.270836		Reject Normality
Kolmogorov-Smirnov	4.997937E-02		Reject Normality
D'Agostino Skewness	-0.7755	0.438065	Accept Normality
D'Agostino Kurtosis	15.1552	0.000000	Reject Normality
D'Agostino Omnibus	230.2809	0.000000	Reject Normality

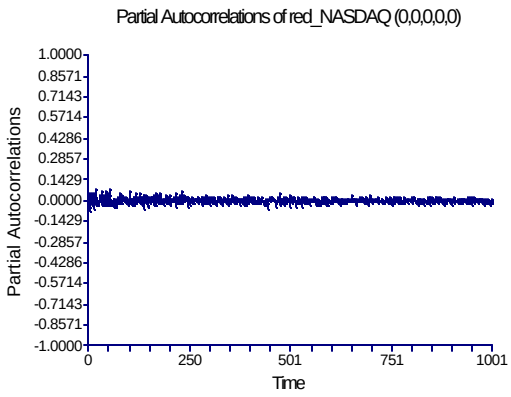
Plots Section of Robust_red_NYSE



Auto Correlation: NASDAQ

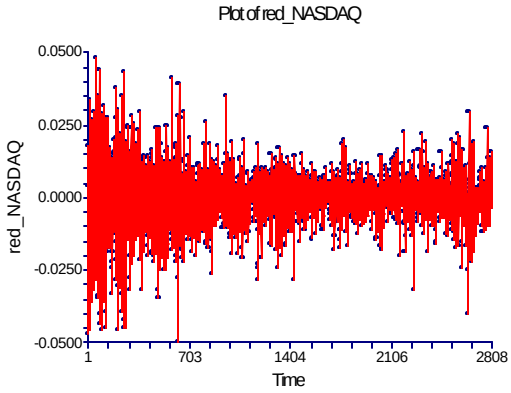
Autocorrelation Plot Section





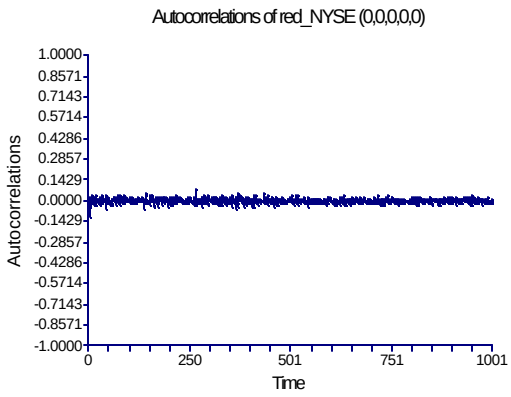
Significant if |Correlation|> 0.037749

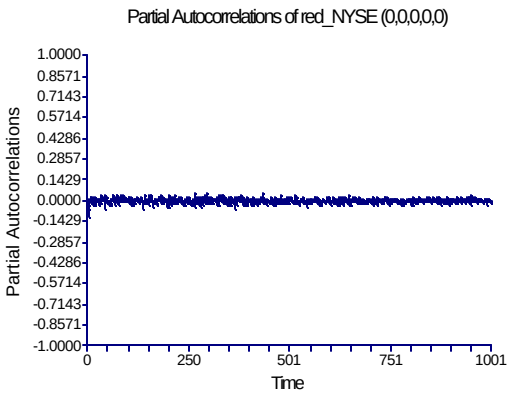
Data Plot Section



Auto Correlation: NYSE

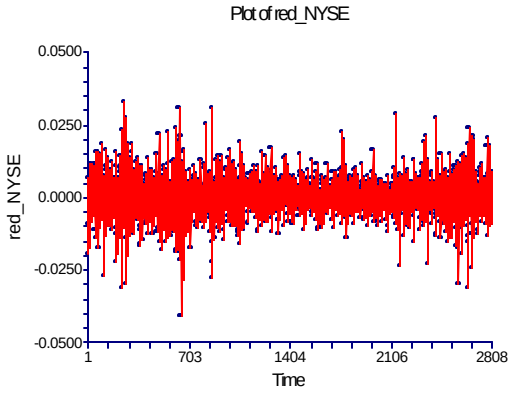
Autocorrelation Plot Section





Significant if |Correlation|> 0.037749

Data Plot Section



REFERENCE LIST

De Bondt, Werber F. M. and Richard Thaler. "Does the stock market overreact?" The Journal of Finance. XL (1985) No. 3.

Chou, Pin-Huang. Bootstrap Tests for Multivariate Event Studies" *Social Science Research Network:* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=144420>

"EMH." The Efficient Market Hypothesis. 1999. Investor Home. 30 October 2001. <http://www.investorhome.com/emh.htm>.

Fabozzi, Frank J. Bond Markets, Analysis and Strategies. New Jersey: Prentice-Hall Inc, 2000.

Fama, Eugene F. 1997, "Market Efficiency, Long-Term Returns, and Behavioral Finance." *Social Science Research Network*: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=15108>

Fama, Eugene F. "Random Walks in Stock Market Prices". 51 (January/February 1995) 1 75-80.

Fama, Eugene F., Lawrence Fisher, Michael Jensen, and Richard Roll. "The adjustment of stock prices to new information." International Economic Review. 10 (1969) 1-21

"Hoover's." Hoover's Online – Financial Services – Investment Banking & Brokerage Industry Listing. Oct 2001. Hoover's Online – Financial Services. 4 May 2001 <http://www.hoovers.com/industry.description/0,2005,4200,00.html>.

Keynes, J. M.. 1964 (reprint of 1936), "The General Theory of Employment, Interest and Money. London: Harcourt Brace Jovanovich.

Kleidon, A. W. 1981, "Stock Prices as Rational Forecasters of Future Cash Flows." Working Paper, Graduate School of Business, University of Chicago.

Lamdin, Douglas J, "Implementing and Interpreting Event Studies of Regulatory Changes." *Social Science Research Network:* <http://papers.ssrn.com/paper.taf?abstract_id=234851>

Griffiths, William E., H. Hill, Judge Carter and G. George. 1993 Learning and Practicing Econometrics. New York: John Wiley & Company, 1993.

Malkiel, Burton G. A Random Walk Down Wall Street. New York: W. W. Norton & Company, 1999

"NYSE." NYSE – New York Stock Exchange. Oct 2002. 2002 NYSE, Inc. 4 May 2001. http://www.nyse.com/>.

Savickas, Robert, 2001, "Abnormal Returns." *Social Science Research Network:* <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=265853>

Van Horne, James C. Financial Market Rates and Flows, New Jersey: Prentice-Hall, Inc., 2001.

Watkins, Thayer. "The Efficient Market Hypothesis." *The Efficient Market Hypothesis.* 2002 San Joes State University Economics Department. 07 January 2002 <http://www.sjsu.edu/faculty/watkins/emh.htm/>

Wooldridge, Jeffery M. Introductory Econometrics: A Modern Approach. Australia: South-Western College Publishing, 2000.

United States. Census Bureau. No. 786. Gross Domestic Product in Finance, Insurance, and Real Estate, in Current and Real (1996) Dollars: 1990 to 1998 Washington: GPO.2000

---. Federal Reserve Board. FOMC Meeting Dates 1970-2001. 18 January 2002 <http://woodrow.mpls.frb.fed.us/info/policy/dates-hist.html>

---. ---. FRB: FOMC. 22 May 2001 <http://www.federalreserve.gov//FOMC>